REMARKS

Claims 1-2, 4-19, and 21-32 are pending in the present application. Claims 6 and 23 have been objected to, and claims 1-2, 4-19, and 21-32 have been rejected under 35 U.S.C. §103(a). Applicant has amended claims 6 and 23. No new matter has been introduced.

Claims Objections

The Examiner objected to claims 6 and 23 for reciting the limitations "1013" and "1016", instead of "10^{13}" and "10^{16}". Applicant has amended claims 6 and 23 to correct these typographical errors. Reconsideration and withdrawal of these objections are respectfully requested.

Section 103 Rejections

Claims 1-2, 4-11, 13-19, 21-27, and 29-32 were rejected under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,888,885 (Xie) in view of U.S. Patent No. 5,532,184 (Kato) and U.S. Patent No. 6,900,447 (Gerlach, *et al.*).

Claims 12 and 28 were rejected under 35 U.S.C. §103(a) as obvious over Xie, Kato, and Gerlach, and further in view of U.S. Patent No. 6,351,007 (Fukushima, *et al.*).

Applicant urges that independent claims 1 and 17 are not obvious over Xie, Kato and Gerlach for at least the reasons presented below.

Applicant urges that the Examiner has failed to make out a *prima facie* case of obviousness for these rejections. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the combination of prior art references must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.

At the very least, the combination of Xie, Kato and Gerlach fails to disclose or suggest all limitations of a method for growing a quantum dot *on a predetermined area of a substrate* by *forming a nucleation site . . . using a focused ion beam wherein an electronic microscope is used to align said ion beam on said predetermined area*, as essentially claimed in claims 1 and 17. Furthermore, at the very least, there is no motivation or suggestion to combine the teachings of Xie, Kato and Gerlach to produce the methods recited by Applciant's claims 1 and 17.

Xie is directed to forming 2-dimensional arrays of quantum dots, which can be made into 3-dimensional arrays by repetitively growing the 2-dimensional arrays. In particular, Xie discloses growing a compressively strained buffer layer on a substrate and forming dislocation lines in the buffer layer. Quantum dots will grow on the surface above the dislocations due to the strain field of the dislocations. The Examiner cited Xie as disclosing forming nucleation sites including at least one surface or subsurface defect at a predetermined area of the substrate by implantation of ions and growing quantum dots on the nucleation sites.

However, Applicant urges that the Examiner has misinterpreted Xie's method. As stated above, Xie uses ions to nucleate dislocations, which will grow parallel to the substrate surface and away from the implantation sites and which will form nucleation sites for quantum dots when the dislocations intersect with other dislocations. Xie does not use the ions directly to form sites for the quantum dots. Since dislocations can grow quite to be many micrometers long, quite long by nano-scale standards, the ion implantation sites may be quite distant from the eventual locations of the quantum dots. Furthermore, Xie's method of forming dislocations which then intersect to form nucleation sites restricts Xie to forming square arrays of sites, whereas the methods recited in claims 1 and 17 can form quantum dots on any array of shapes on the substrate. Thus, Applicant urges that Xie does not disclose or suggest *forming a nucleation site . . . by implantation with ions,* as essentially recited in claims 1 and 17.

The Examiner concedes that Xie fails to disclose the method by which ions are implanted onto a substrate, but then cites Kato as disclosing using a focused ion beam (FIB) to implant ions into a substrate to form locations at which quantum dots can be grown. Kato is directed to fabricating semiconductor devices by implanting dopants, e.g. GaAs/AlGaAs/GaAs, into the top layer of a layered material, using a focused ion beam (FIB), to produce the quantum dot in the middle layer. These different regions in the semiconductor with differing dopants have different electronic properties. Kato does not disclose growing a quantum dot on a surface, but rather discloses encapsulating a dopant within a semiconductor layer to alter the electronic properties of the surrounding material, to define regions that can act as dots.

The methods recited in claims 1 and 17, however, form quantum dots by growing one material on top of another with a different atomic spacing. The strain due to the differences in atomic spacing, combined with the surface energies, cause the first material to grow into small volumes rather than into a flat film. These small volumes act as quantum dots because their composition, hence their electronic properties, are different from the substrate crystal. One skilled in the art of growing quantum dots on surfaces would not consider the teaching of Kato to be relevant, since Kato forms quantum dots in a different way, implantation rather than by growth, and thus there is no motivation or suggestion to combine the FIB of Kato with the method of Xie.

The Examiner cites Gerlach as disclosing an electronic microscope to align a FIB on a substrate. However, Gerlach does not rectify the defects of Xie and Kato as discussed above.

Thus, since there is no motivation or suggestion to combine the teachings of Xie, Kato, and Gerlach to produce the methods recited by Applicant's claims 1 and 17, and since the combination of Xie, Kato, and Gerlach fail to disclose the limitations of claims 1 and 17, a *prima facie* case of obviousness of claims 1 and 17 over Xie, Kato, and Gerlach cannot be maintained. Reconsideration and withdrawal of these section 103 rejections are respectfully requested.

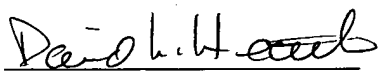
Claims 2, 4-16, 18-19, and 21-32 all depend from either claim 1 or claim 17, and are patentable for at least the same reasons as claims 1 and 17. Reconsideration and withdrawal of these section 103 rejections are respectfully requested.

Regarding dependent claims 12 and 28, Applicant urges that Fukushima fails to rectify the deficiencies of Xie, Kato and Gerlach discussed above. Thus, Applicant urges that claims 12 and 28 are not *prima facie* obvious over Xie, Kato, Gerlach, and Fukushima. Reconsideration and withdrawal of these section 103 rejections are respectfully requested.

CONCLUSION

Applicant urges that claims 1-2, 4-19, and 21-32 are in condition for allowance for at least the reasons stated. Early and favorable action on this case is respectfully requested.

Respectfully submitted,

By: 

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